Domestic Uses and Safety

Question Paper 1

Level	GCSE (9-1)
Subject	Combined Science: Trilogy - Physics
Exam Board	AQA
Topic	6.2 Electricity
Sub-Topic	Domestic Uses and Safety
Difficulty Level	Silver Level
Booklet	Question Paper 1

Time Allowed: **57 minutes**

Score: **/56**

Percentage: **/100**

Grade Boundaries:

Q1. An electric current is a flow of electrical charge through a circuit.

(a) Complete the sentence.

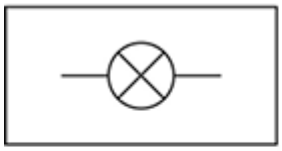
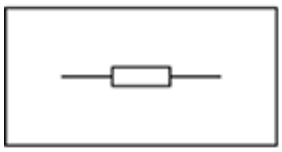
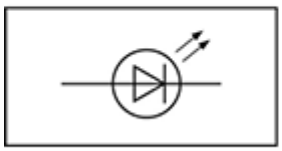
Use a word from the box.

atoms	**electrons**	**ions**	**molecules**

Metals are good conductors of electricity because electrical charge is transferred by delocalised .....

(1)

(b) Draw **one** line from each symbol to the name of the component.

Standard symbol	**Name of component**
	Battery
	Lamp
	LED
	Resistor
	Switch

(3)

(c) The table below shows information about some electrical appliances.

Electrical appliance	**Power in watts**

 Hairdryer	1500
 Kettle	2500
 Electric hob	3000
 Television	360

A student plugs all four of the appliances into one multi-way socket.

The mains electricity is 230 V.

The highest safe current in the socket is 30 A.

Explain why it is not safe to use all four appliances at the same time.

In your answer you should:

- calculate the total power needed
- use the equation

  current = power ÷ potential difference

  to calculate the total current needed.

.....

.....

.....

.....

.....

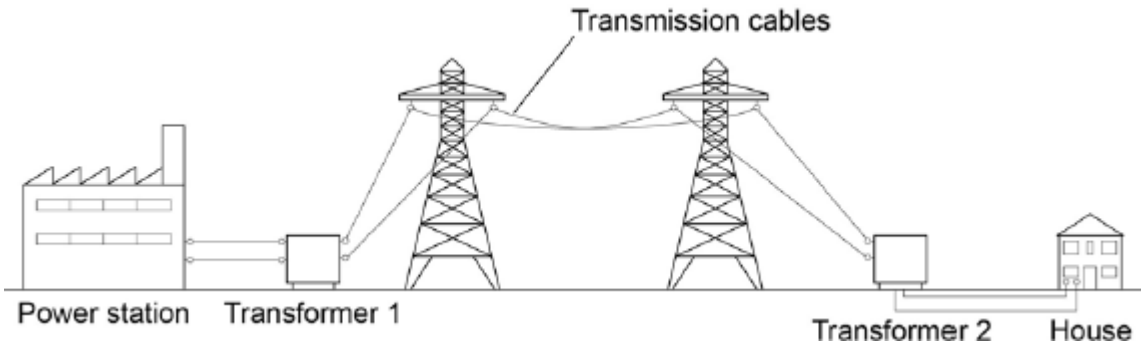
.....

.....

.....

(4)

(d) The figure below shows how electrical power is transferred from power stations to consumers using the National Grid.



Transformer 1 is a step-up transformer.

Explain why step-up transformers are used in the National Grid.

.....

.....

.....

.....

.....

.....

(3)

(e) What is the purpose of Transformer 2?

.....

.....

(1)

(f) In a power station 900 MJ of thermal energy were released by burning natural gas.

Write down the equation that links efficiency, useful input energy transfer and useful output energy transfer.

.....

(1)

(g) In a power station 900 MJ of thermal energy were released by burning natural gas.

Only 405 MJ was generated.

Calculate the efficiency of this energy transfer.

.....

.....

.....

Efficiency = ...

(2)
(Total 15 marks)

Q2.A student finds some information about energy-saving light bulbs.

(a) A 30W light bulb uses 600J of electrical energy in a certain period of time. In that time, it produces 450 J of light energy. The rest of the energy is wasted.

(i) Calculate the energy wasted by the light bulb in this period of time.

.....

Wasted energy = ... J

(1)

(ii) What happens to the energy wasted by the light bulb?

.....

.....

(1)

(iii) Calculate the efficiency of this light bulb.

.....

.....

Efficiency = ...

(2)

(iv) Calculate the period of time, in seconds, during which the 600 J is provided to the 30 W light bulb.

.....

.....

Time = ... s

(2)

(b) A company that makes light bulbs provides information about some of their products.

The table shows some of this information.

	Power in watts	**Lifetime in hours**	**Cost of bulb in £**
Filament bulb	60	1250	2.00
LED bulb	12	50 000	16.00

(i) Suggest why it is important to confirm this information independently.

.....

(1)

(ii) A homeowner is thinking about replacing his filament bulbs with LED bulbs.

A 12 W LED bulb gives the same light output as a 60 W filament bulb.

Suggest reasons why the homeowner is likely to choose LED bulbs.

Use the information given in the table.

.....

.....

.....

.....

(2)

(iii) State **one** factor, other than efficiency, that is important when considering the choice of a bulb for lighting in the home.

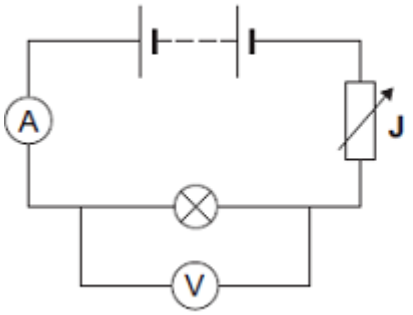
.....

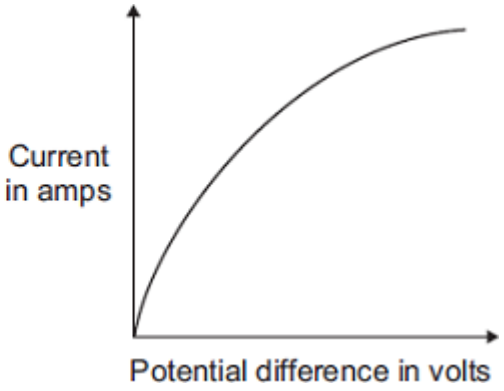
.....

(1)

(Total 10 marks)

Q3.(a) The diagram shows the circuit used to obtain the data needed to plot the current–potential difference graph for a filament bulb.





(i) Why is the component labelled '**J**' included in the circuit?

.....

.....

(1)

(ii) The resistance of the bulb increases as the potential difference across the bulb increases. Why?

.....

.....

(1)

(iii) The bulb is at full brightness when the potential difference across the bulb is 12 V.
The current through the bulb is then 3 A.

Calculate the power of the bulb when it is at full brightness and give the unit.

.....

.....

.....

Power = ...

(3)

(b) *In this question you will be assessed on using good English, organising information clearly and using specialist terms where appropriate.*

The table gives data about two types of light bulb people may use in their homes.

Type of light bulb	Energy efficiency	Cost of one light bulb	Average lifetime in hours
Halogen	10%	£1.95	2 000
Light Emitting Diode (LED)	32%	£11.70	36 000

Both types of light bulb produce the same amount of light.

Evaluate, in terms of cost and energy efficiency, the use of the two types of light bulb.

To gain full marks you must compare both types of light bulb and conclude which light bulb would be the best to use.

.....

.....

.....

.....

.....

.....

.....

.....

.....

(6)
(Total 11 marks)

Q4.Diagram 1 shows a hairdryer.
Diagram 2 shows how the heaters and fan of the hairdryer are connected to a 3-pin plug.
The hairdryer does not have an earth wire.

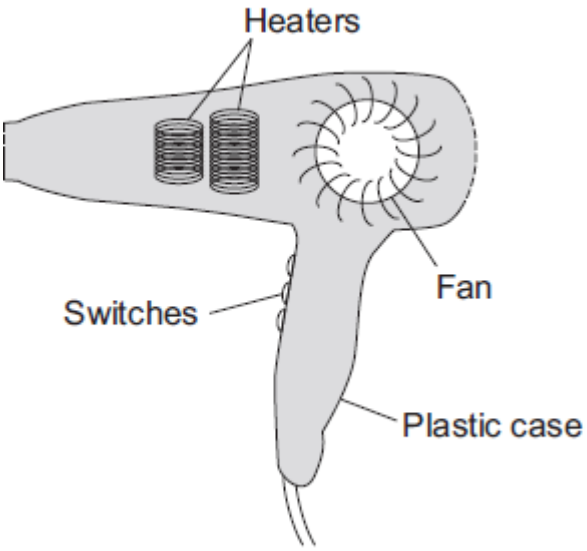


Diagram 1

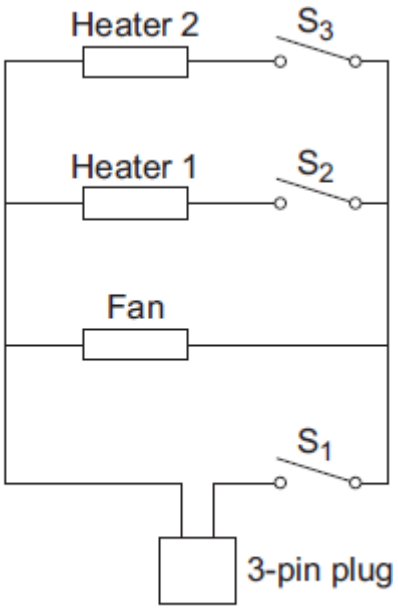


Diagram 2

(a) What colour is the insulation around the wire connected to the live pin inside the plug?

.....

(1)

(b) Why does the hairdryer **not** need an earth wire?

.....

.....

(1)

(c) All the switches are shown in the OFF position.

(i) Which switch or switches have to be ON to make:

(1) only the fan work; .....

(2) heater 2 work? .....

(2)

(ii) The heaters can only be switched on when the fan is also switched on.

Explain why.

.....

.....

.....

.....

.....

(2)

(d) The table shows the current drawn from the 230 volt mains electricity supply when different parts of the hairdryer are switched on.

	Current in amps
Fan only	1.0
Fan and heater 1	4.4
Fan and both heaters	6.5

Calculate the maximum power of the hairdryer.

Show clearly how you work out your answer and give the unit.

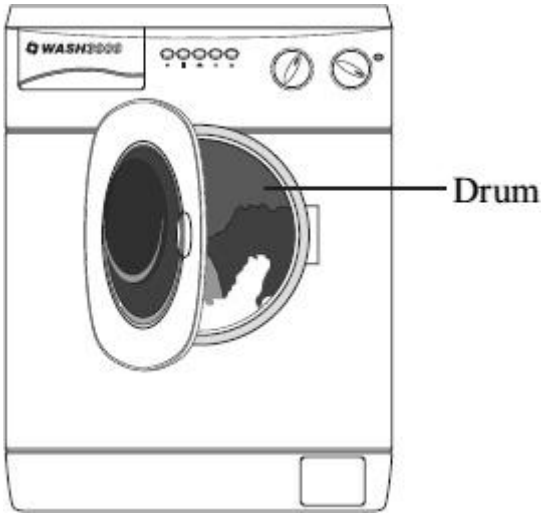
.....

.....

Maximum power = ...

(3)
(Total 9 marks)

Q5. The picture shows a new washing machine. When the door is closed and the machine switched on, an electric motor rotates the drum and washing.



(a) What happens to the energy wasted by the electric motor?

.....

.....

(1)

(b) The diagram shows the label from the new washing machine.

Model – Wash 3000 **Energy A**	
More efficient A B C D E Less efficient	A
Energy consumption kWh/wash cycle (based on 40 °C wash)	1.1

An 'A' rated washing machine is *more energy efficient* than a 'C' rated washing machine.

Explain what being *more energy efficient* means.

.....

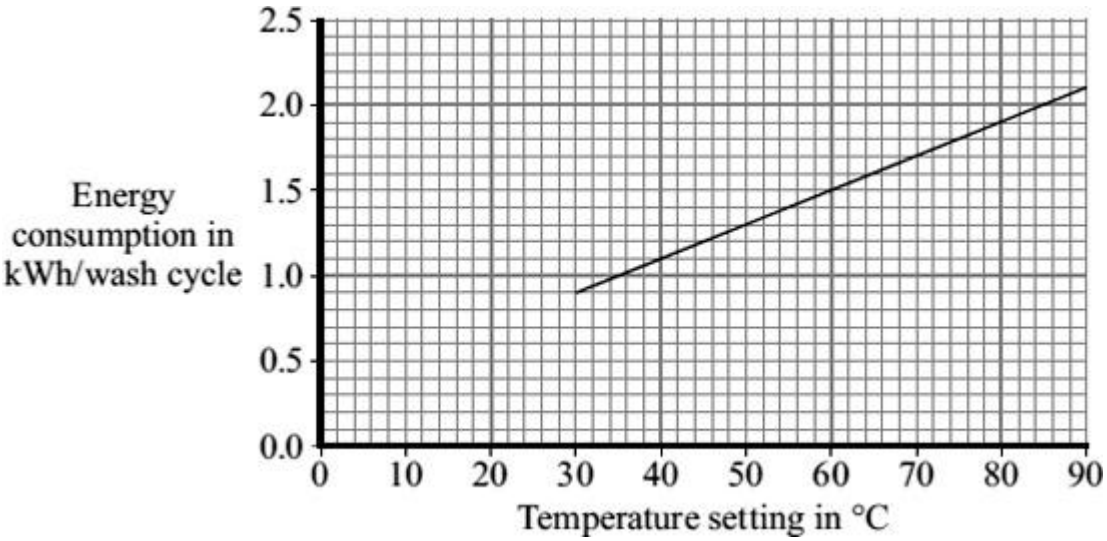
.....

.....

.....

(2)

(c) The graph shows that washing clothes at a lower temperature uses less energy than washing them at a higher temperature. Using less energy will save money.



(i) Electricity costs 12 p per kilowatt-hour (kWh).
The temperature setting is turned down from 40 °C to 30 °C.

Use the graph and equation in the box to calculate the money saved each wash cycle.

total cost = number of kilowatt-hours × cost per kilowatt-hour

Show clearly how you work out your answer.

.....

.....

Money saved = ... p

(2)

(ii) Suggest why reducing the amount of energy used by washing machines could reduce the amount of carbon dioxide emitted into the atmosphere.

.....

.....

(1)

(Total 6 marks)

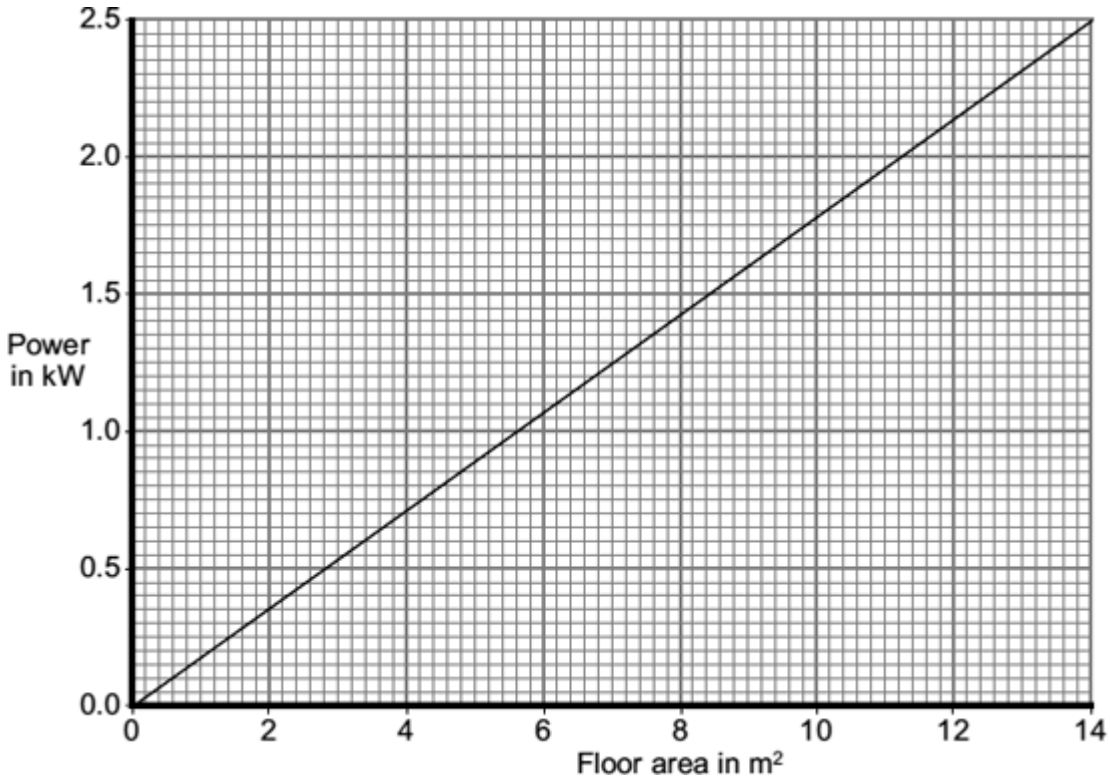
Q6. A homeowner has installed electric underfloor heating in the kitchen. When the heating is switched on, an electric current flows through wires running under the tiled floor surface.

(a) What is an electric current?

.....

(1)

(b) The graph shows how the power output of an underfloor heating system depends on the area of the floor that is heated.



The area of the homeowner's kitchen floor is 9.0 m^2

Calculate, using the graph, the current drawn from the 230 V mains supply by the heating system.

Show clearly how you work out your answer and give the unit.

.....

.....

.....

.....

Current = ...

(4)

(Total 5 marks)